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NC Scope- Quick Start

v.1.2

Monitorowanie osi

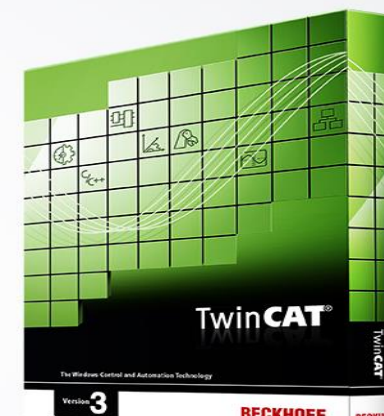
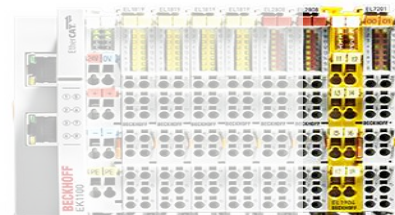


Konfiguracja parametrów:

- Odczytywanie Torque Value
- Aktywacja Read Symbols w Process Image
- Aktywacja obliczania Acceleration w enkoderze

Konfiguracja wykresów:

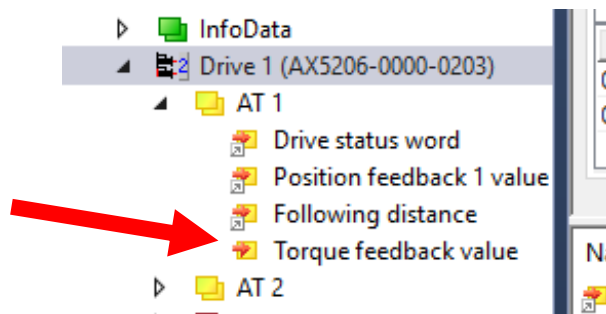
- Wykres YT
- Linkowanie osi ze zmiennymi
- Deaktywacja wykresu Position Modulo
- Dodanie drugiej osi
- Parametry rysowanych zmiennych
- Dodawanie wykresu Torque
- Skalowanie wykresów



Konfiguracja parametrów: Odczytywanie Torque Value

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1. Utwórz czysty projekt, zeskanuj i skonfiguruj silnik. Zlinkuj osie.
2. W zakładce **Drive > Drive Manager > Channel X > Configuration > Process Data/Operation Mode**, wyszukaj spośród zmiennych parametru AT: **S-0-0084 Torque feedback value**.
3. Aktywuj parametr przeciągając go na prawą stronę za pomocą przycisku: >>
4. Powinna pokazać się dodatkowa zmienna procesowa typu input w: **Solution Explorer > (Projekt) > I/O > Devices > Device 1 (EtherCAT) > Drive 1 > AT1**



Monitorowanie osi

General EtherCAT DC Process Data Startup SoE - Online Online Drive Manager NC-B: Online NC-B: Functions NC-A: Online NC-A: Functions

Linked NC/CNC axes: Channel A<=>NC: Axis 1 Channel B<=>NC: Axis 2

Tree

- Device
 - Power management
 - Safety option
 - Display
 - Digital I/O
 - Watch window
- Channel A
 - Configuration
 - Motor and Feedback
 - Scaling and NC parameters
 - Process Data/Operation mode
 - Controller overview
 - V/f control
 - Probe unit
 - Error reaction / drive halt
 - Parameter list
 - Service functions
 - Diagnostics
- Channel B
 - Configuration
 - Service functions
 - Diagnostics

Channel A>>Configuration>>Process Data/Operation mode

Linked NcAxis: TINC^NC-Task 1 SAF^Axes^Axis 1

Change link

Configured operation modes:

| IDN | Name | ActValue | SetValue |
|----------|------------------------|----------------------------------|----------------------------------|
| S-0-0032 | Primary operation mode | 11: pos ctrl feedback 1 lag less | 11: pos ctrl feedback 1 lag less |

Add Remove

AT or MDT: AT

Available parameters for Process Data

- S-0-0011: Class 1 diagnostic (C1D)
- S-0-0012: Class 2 diagnostic (C2D)
- S-0-0013: Class 3 diagnostic (C3D)
- S-0-0029: MDT error counter
- S-0-0040: Velocity feedback value 1
- S-0-0053: Position feedback value 2 (external f
- S-0-0130: Probe value 1 positive edge
- S-0-0131: Probe value 1 negative edge
- S-0-0179: Probe status
- S-0-0347: Velocity error
- S-0-0380: DC bus voltage
- S-0-0381: DC bus current
- S-0-0383: Motor temperature
- S-0-0384: Amplifier temperature
- S-0-0390: Diagnostic number
- S-0-0409: Probe 1 positive latched
- S-0-0410: Probe 1 negative latched
- P-0-0040: Additional drive status word
- P-0-0063: Thermal motor utilisation
- P-0-0064: Actual Motorbrake current
- P-0-0097: Motor status word
- P-0-0159: Raw position feedback value 1
- P-0-0189: Raw position feedback value 2
- P-0-0205: Power Management status word

Parameters for Process Data

- S-0-0135: Drive status word
- S-0-0051: Position feedback value 1 (motor feedba
- S-0-0189: Following distance
- S-0-0084: Torque feedback value

>> <<

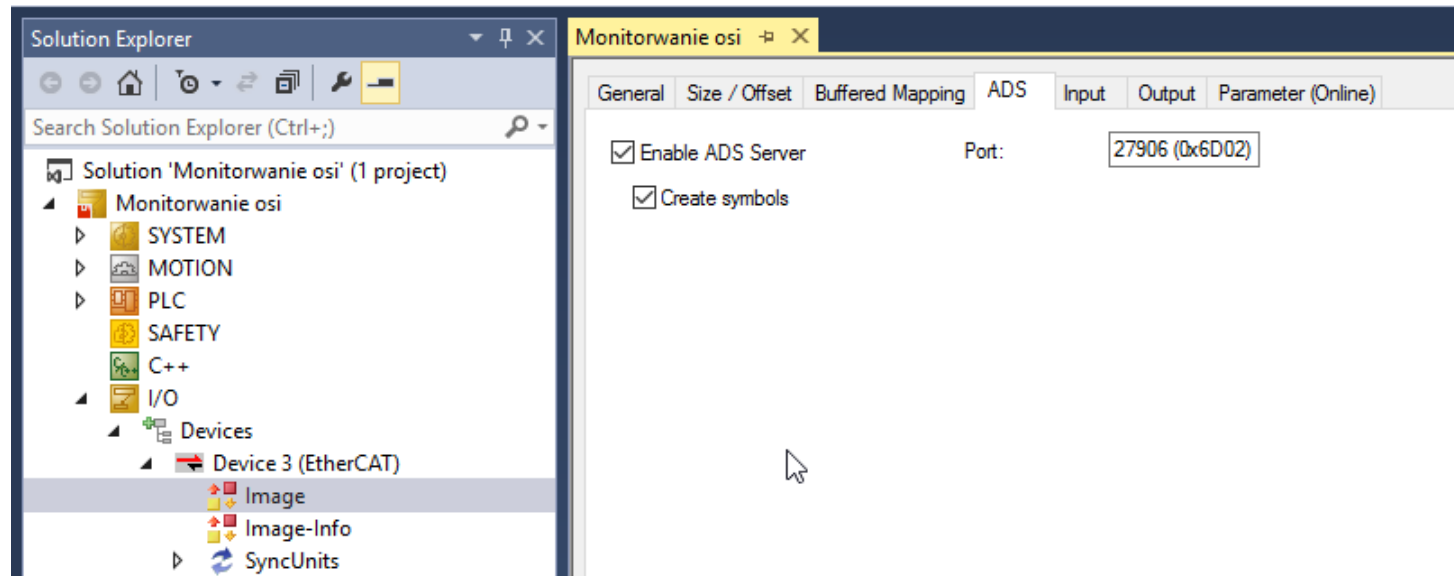
Up Down

| Op | AxisState | Diag Code | Diag Msg | Umain OK | DcLink OK | Ampl-Te... | Actual op... | v <= v_0 | Positive c... | Negative ... | Pe |
|-----------|-------------|------------|----------|-----------------------|-----------|------------|--------------|-------------------|---------------|--------------|----|
| Channel A | Drive Ready | 0x0000D012 | R | Axis state machine... | ● | ● | 34.7 | 11: pos ctrl f... | ● | ● | ● |
| Channel B | Drive Ready | 0x0000D012 | R | Axis state machine... | ● | ● | 35.7 | 11: pos ctrl f... | ● | ● | ● |

Konfiguracja parametrów: Aktywacja Read Symbols w Process Image

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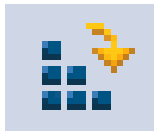
1. Przejdź do zakładki **EtherCAT** > **Image** > **ADS**
2. Aktywuj: **Enable ADS Server** oraz **Create Symbols**



Konfiguracja parametrów: Aktywacja obliczania Acceleration w Enkoderze

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1. Przejdź do zakładki **MOTION** > **NC-Task 1 SAF** > **Axes** > **Axis X** > **Enc**
2. W otwartym oknie przejdź do zakładki: **Parameter** > **Other Settings** > **Encoder Mode**
3. Wybierz w Offline value: **POSVELOACC**
4. Kliknij **DOWNLOAD**.
5. Kliknij **OK**.
6. Aktywuj konfigurację:



The screenshot shows the 'Monitorowanie osi' (Axis Monitoring) window in the Beckhoff NC Scope software. The 'Parameter' tab is selected, and the 'Encoder Mode' parameter is set to 'POSVELOACC'. A red arrow points to the 'Download' button at the bottom of the window.

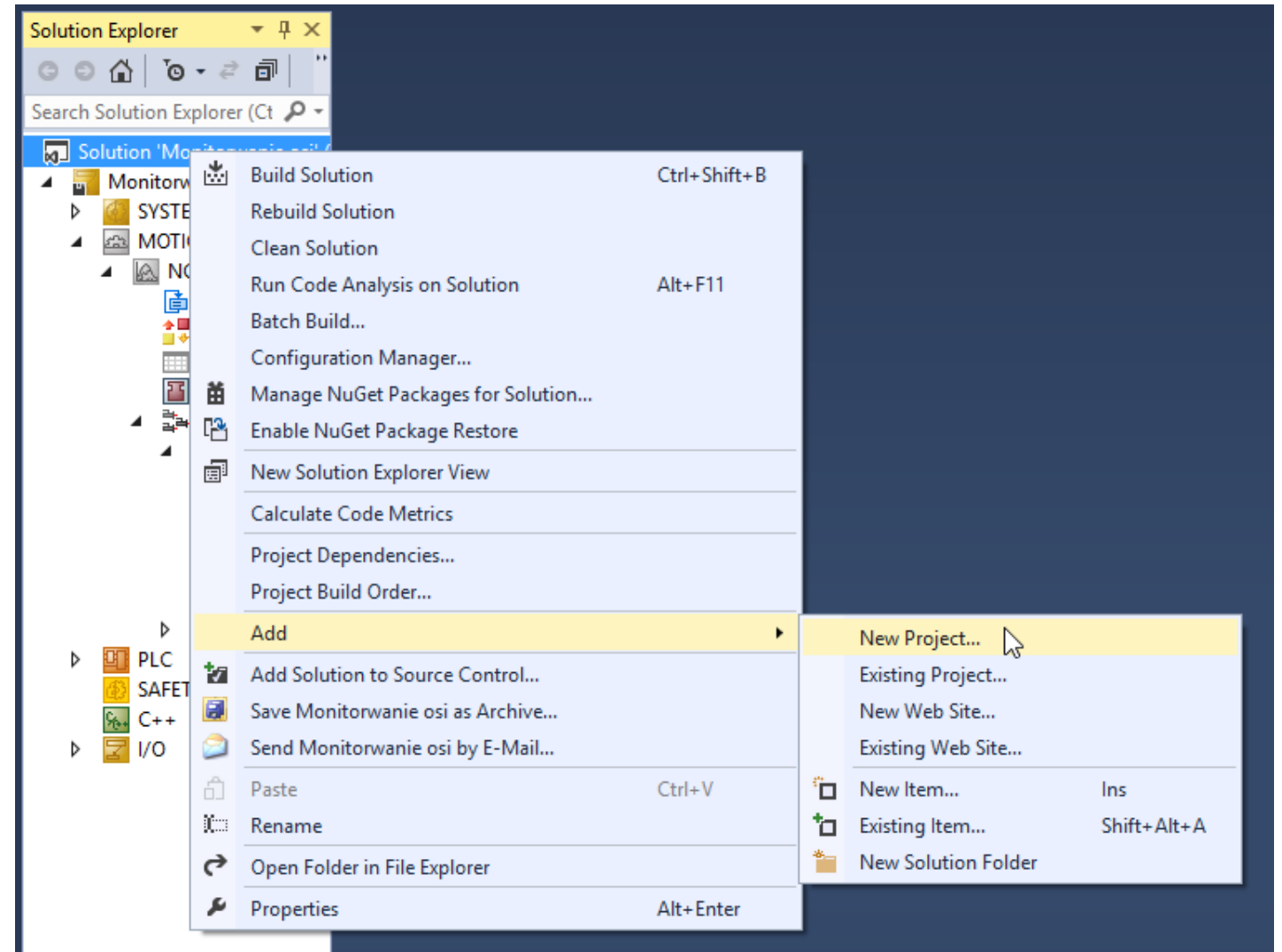
| Parameter | Offline Value | Online Value | Unit |
|--|---------------|--------------|------|
| Encoder Evaluation: | | | |
| Limit Switches: | | | |
| Filter: | | | |
| Homing: | | | |
| Other Settings: | | | |
| Encoder Mode | 'POSVELOACC' | 'POSVELO' | |
| Position Correction | FALSE | FALSE | |
| Filter Time Position Correction (P-T1) | 0.0 | 0.0 | s |

Buttons at the bottom: Download, Upload, Expand All, Collapse All, Select All.

Rysowanie wykresów: Tworzenie projektu Scope Measurement

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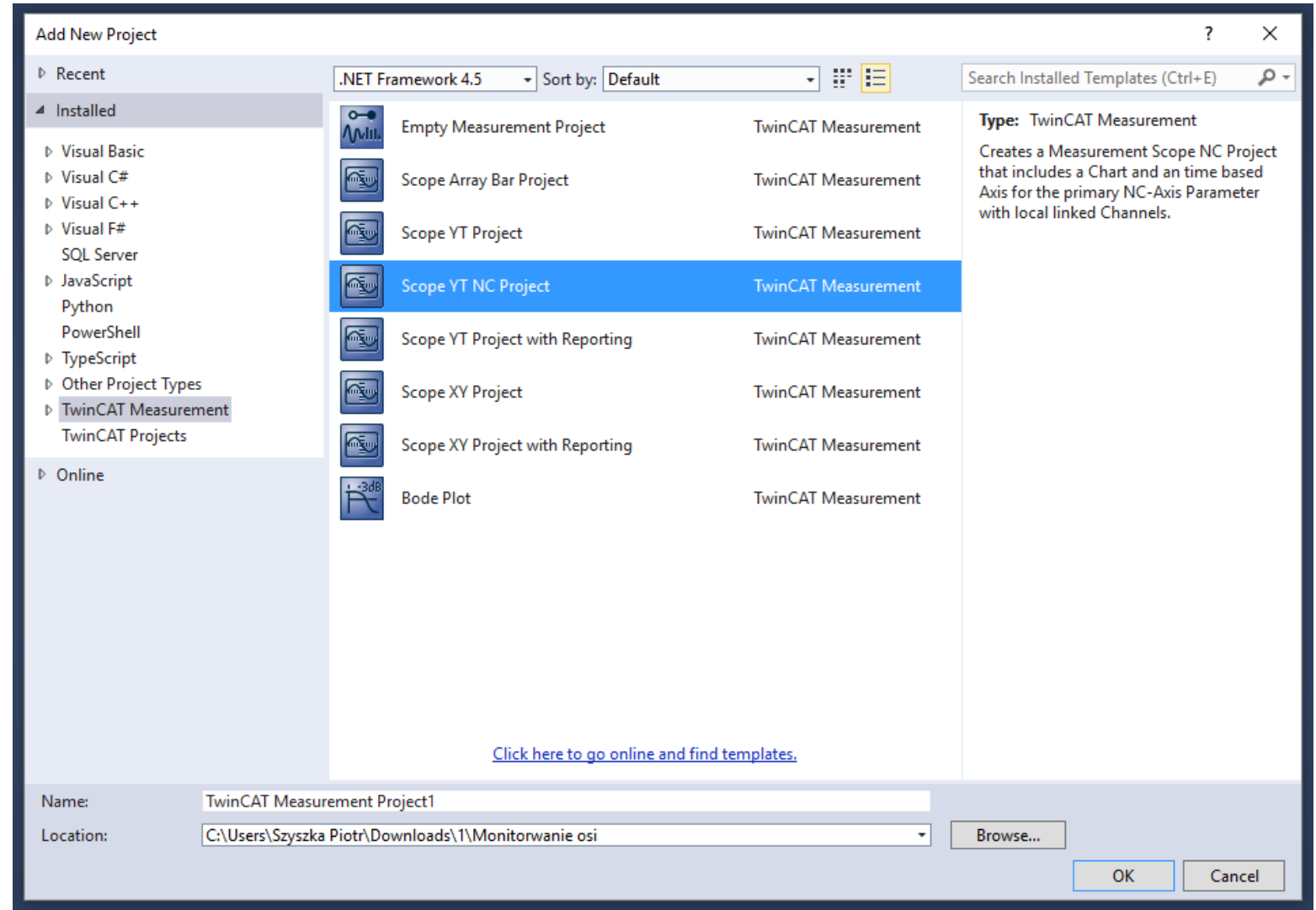
1. Kliknij Prawym Przyciskiem Myszy (**PPM**) na solution. Wybierz: **Add > New Project**



Rysowanie wykresów: Tworzenie projektu Scope Measurement

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1. Wybierz Scope YT NC Project



Rysowanie wykresów: Linkowanie osi ze zmiennymi

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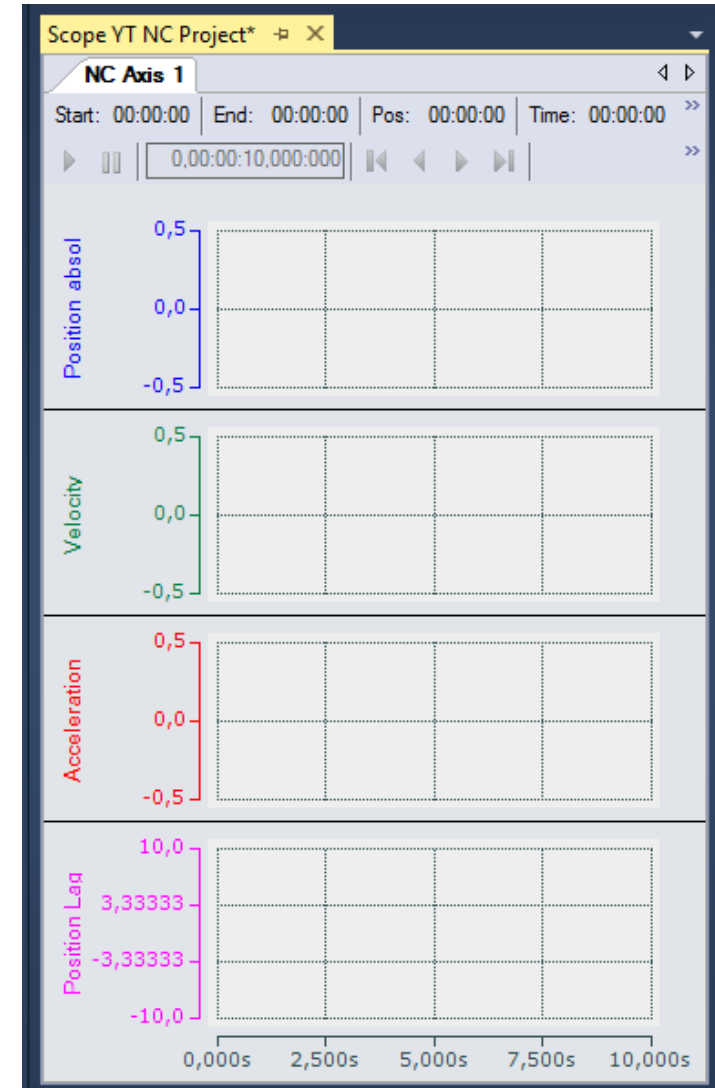
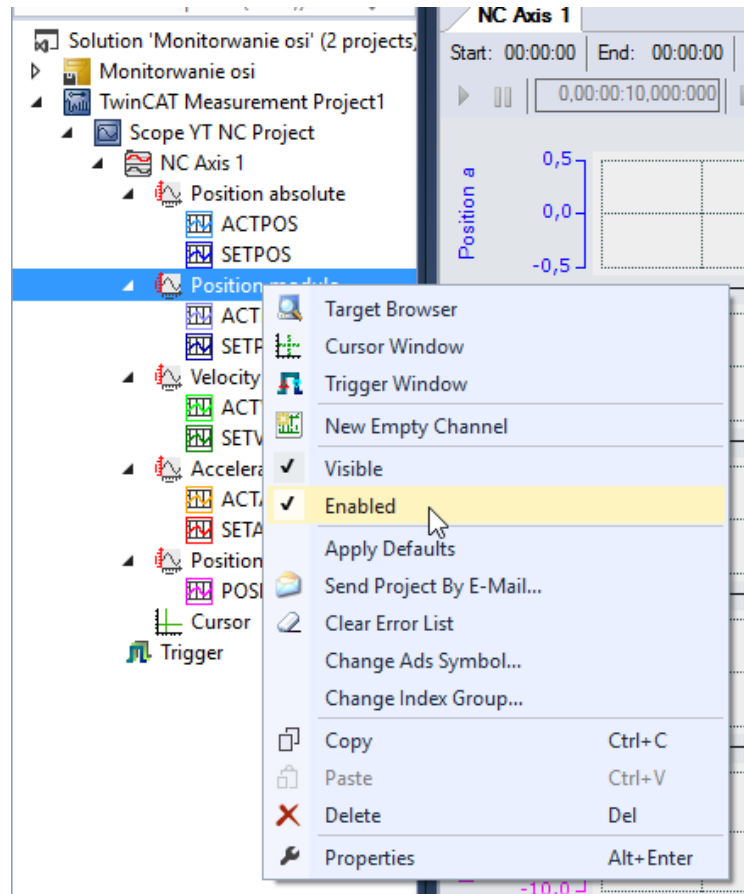
1. Przytrzymując lewy **ALT**, dwukrotnie kliknij Lewym Przyciskiem Myszy (**LPM**) na jedną ze zmiennych np. **ACTPOS**
2. W oknie Properties w pozycji **Target System** wybierz urządzenie docelowe.

The screenshot displays the Beckhoff NC Scope software interface. On the left, the 'Solution Explorer' shows a project structure with 'NC Axis 1' expanded, listing various measurement variables like 'Position absolute', 'Position modulo', 'Velocity', and 'Acceleration'. The 'ACTPOS' variable is highlighted. In the bottom-left corner, a dropdown menu for 'Target System' is open, showing a list of available systems including 'Local (127.0.0.1.1.1)', 'ASUS (192.168.1.102.1.1)', 'CP-0FB556 (10.24.2.64.1.1)', 'CX-16C0D0 (5.22.192.208.1.1)', and 'CX-1CAA12 (5.28.170.18.1.1)'. The main window, titled 'Monitorowanie osi - Scope YT NC Project', shows a real-time monitoring view for 'NC Axis 1' with four graphs: 'Position a', 'Position', 'Velocity', and 'Acceleration'. The 'Properties' panel on the right shows the configuration for 'ACTPOS', including 'Data-Type: REAL64', 'Enabled: True', 'Sample State: TaskSampleTime', 'Sample Time [ms]: 2', 'Symbol based: False', 'Symbol Comment', 'Symbol Index Group: 0x4101', 'Symbol Index Offset: 0x10002', 'Symbol Name: AXES.AXIS 1.ACTPOS', 'Symbol Size: 8', 'Target Port: 501 : R0_NCSAF', 'Target System: Local (127.0.0.1.1.1)', 'Time Offset [s]: 0', 'Use Local Server: True', 'Comment', 'Visible: True', 'Antialias: True', and 'Fill Color: #FF0000'.

Rysowanie wykresów: Deaktywacja wykresu Position Modulo

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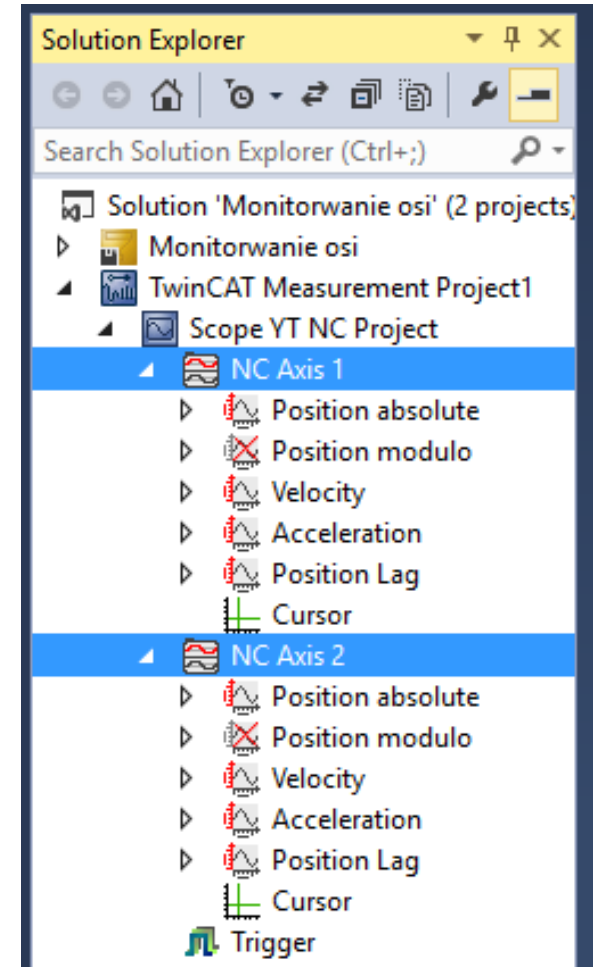
1. Kliknij PPM na **Position Modulo** > **Enable**



Rysowanie wykresów: Kopia wykresu dla pozostałych osi

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1. Kliknij LPM na: **NC Axis 1** i ją skopiuj.
2. Kliknij LPM na Scope YT NC Project i wklej. Powstanie nowa oś NC Axis.



Rysowanie wykresów: Podmiana linków w drugiej osi

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1. Przytrzymując lewy **ALT** kliknij dwukrotnie LPM na jej zmiennych w drugiej osi.
2. Podmień: **Symbol Index Group** na kolejną wartość.

| | |
|---------------------|----------------|
| Symbol Comment | |
| Data-Type | REAL64 |
| Symbol Index Group | 0x4102 |
| Symbol Index Offset | |
| Symbol Name | |
| Symbol Size | 8 |
| Target Port | 501 : R0_NCSAF |

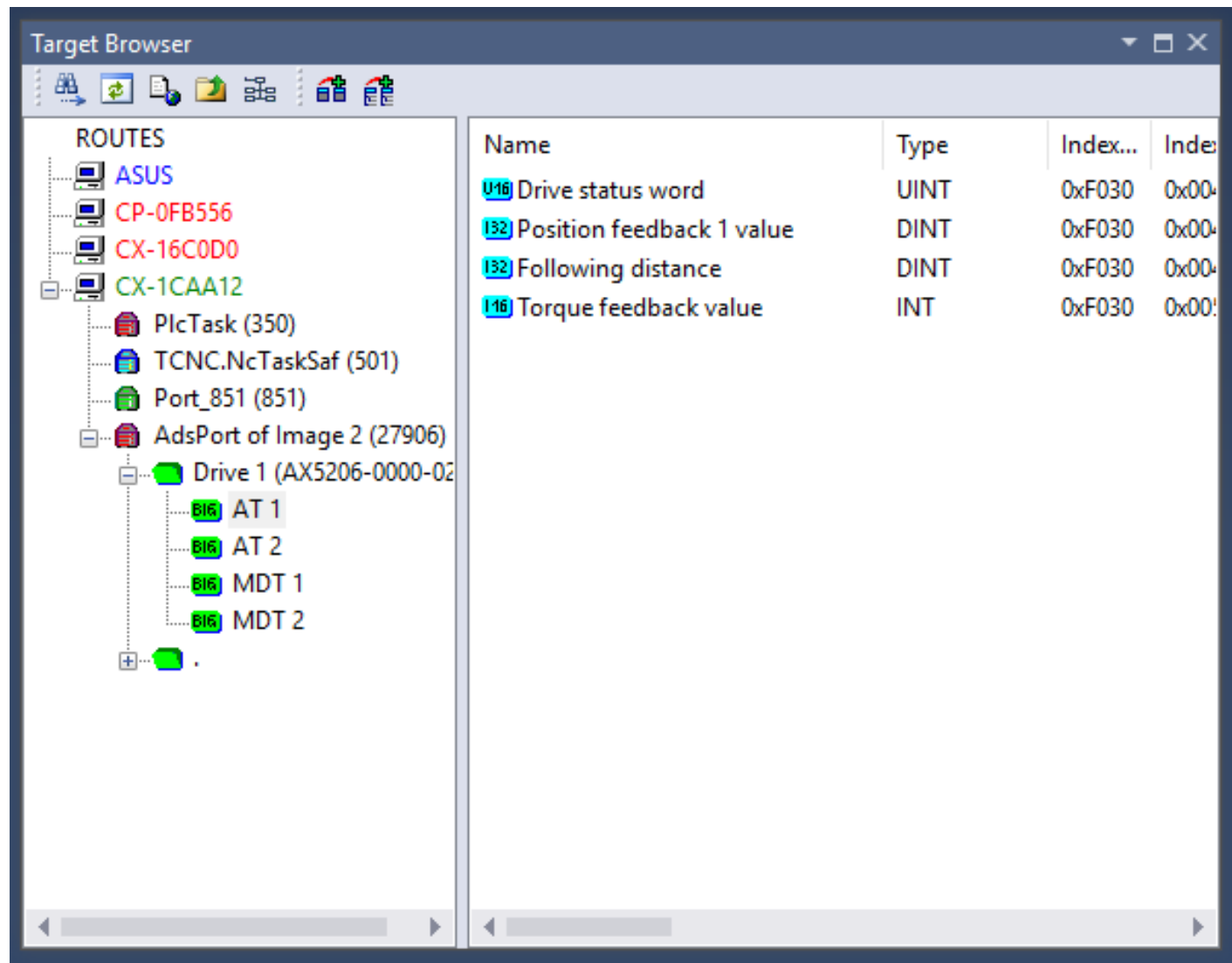
The screenshot shows the Beckhoff TwinCAT software interface. The **Solution Explorer** window on the left displays the project structure for 'Monitorowanie osi'. Under 'NC Axis 2', the 'Position absolute' folder is expanded, showing variables like 'ACTPOS(1)', 'SETPOS(1)', 'ACTPOSMODULO(1)', and 'SETPOSMODULO(1)'. The **Properties** window on the right shows the configuration for the selected variable. The 'Symbol Index Group' property is highlighted in blue, and its value is '0x4101'. A red arrow points from this property to the 'NC Axis 2' folder in the Solution Explorer.

| Properties | |
|---------------------|-----------------------------|
| Acquisition | |
| Enabled | True |
| Sample State | TaskSampleTime |
| Sample Time [ms] | 2 |
| Symbol based | False |
| Symbol Comment | |
| Data-Type | REAL64 |
| Symbol Index Group | 0x4101 |
| Symbol Index Offset | |
| Symbol Name | |
| Symbol Size | 8 |
| Target Port | 501 : R0_NCSAF |
| Target System | CX-1CAA12 (5.28.170.18.1.1) |
| Time Offset [s] | 0 |
| Use Local Server | True |
| Common | |
| Comment | |
| Visible | True |
| Line | |
| Antialias | True |
| Fill Color | |
| Fill Transparency | 50 |
| Fill Mode | None |
| Line Color | |
| Line Width | 2 |
| Graph Type | Line |
| Marks | |
| Mark Color | |

Rysowanie wykresów: Dodawanie do wykresu zmiennej Torque

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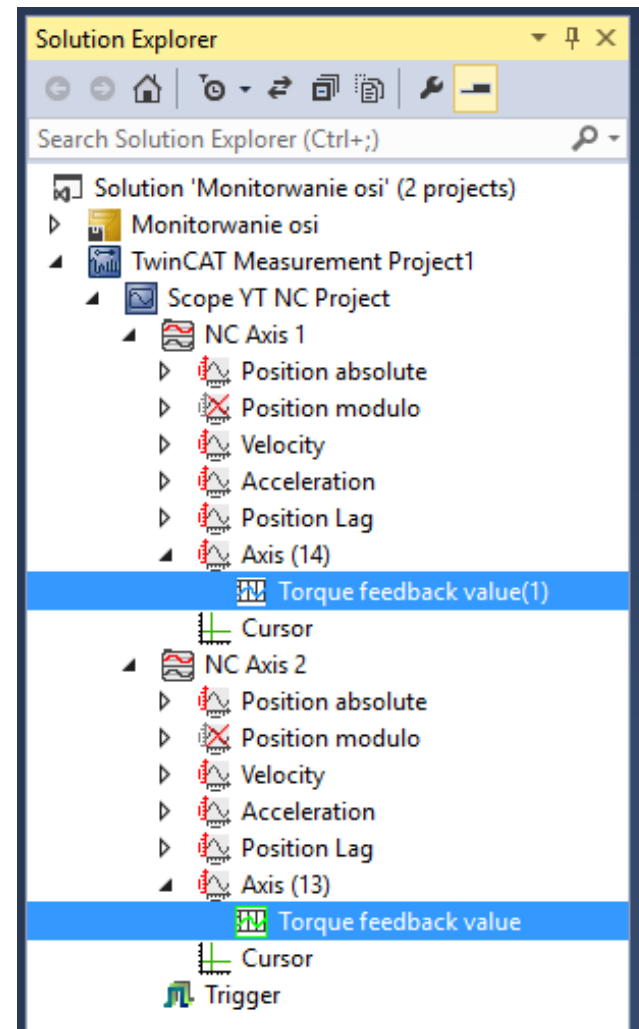
1. Dla każdego wykresu należy dodać oddzielnie zmienną Torque.
2. Kliknij PPM na **NC Axis X** w Solution Explorer i dodaj nową oś: **New Axis**
3. Otwórz z paska Visual studio: **SCOPE** > **Target Browser**.
4. Wybierz w **Target Browser** > **(sterownik)** > **AdsPort...** > **Drive X** > **AT1** > **Torque Feedback Value**
5. Przeciągnij zmienną **Torque** do nowo utworzonej osi w **NC Axis X**
6. Edytuj nazwy osi i zmiennej. Kliknij LPM na element, naciśnij **F2** i wpisz nazwę.



Rysowanie wykresów: Dodawanie do wykresu zmiennej Torque

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1. Dla każdego wykresu należy dodać oddzielnie zmienną Torque.
2. Kliknij PPM na **NC Axis X** w Solution Exploler i dodaj nową oś: **New Axis**
3. Otwórz z paska Visual studio: **SCOPE** > **Target Browser**.
4. Wybierz w **Target Browser** > **(sterownik)** > **AdsPort...** > **Drive X** > **AT1** > **Torque Feedback Value**
5. Przeciągnij zmienną **Torque** do nowo utworzonej osi w **NC Axis X**
6. Edytuj nazwy osi i zmiennej. Kliknij LPM na element, naciśnij **F2** i wpisz nazwę.



Rysowanie wykresów: Dodawanie do wykresu zmiennej Torque

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1. W osi Torque zaznacz w oknie **Properties > Show Caption : TRUE**

The screenshot displays the Beckhoff NC Scope software interface. On the left, the **Solution Explorer** shows the project structure. Under **Scope YT NC Project**, **NC Axis 1** is expanded, and the **Torque** variable is highlighted with a red arrow. The main window shows the **Scope YT NC Project** with five stacked plots: **Position a**, **Velocity**, **Acceleration**, **Position L**, and **Torque**. The **Torque** plot is at the bottom and is highlighted with a red arrow. On the right, the **Properties** window is open, showing the **Torque** variable's properties. The **Show Caption** property is set to **True**, and it is highlighted with a red arrow.

Solution Explorer

- SyncUnits
- Inputs
- Outputs
- InfoData
- Drive 1 (AX5206-0000-0203)
- Mappings
- TwinCAT Measurement Project1
 - Scope YT NC Project
 - NC Axis 1
 - Position absolute
 - Position modulo
 - Velocity
 - Acceleration
 - Position L
 - Torque
 - Torque1
 - NC Axis 2
 - Position absolute
 - Position modulo
 - Velocity
 - Acceleration
 - Position Lag
 - Axis (13)
 - Torque feedback value

Scope YT NC Project

Start: 00:00:00 End: 00:00:00 Pos: 00:00:00 Time: 00:00:00

0,00:00:00,000:010

Position a

0,48
-2,0
E-002
-0,52

Velocity

0,5
0,0
-0,5

Acceleration

0,5
0,0
-0,5

Position L

0,5
0,0
-0,5

Torque

0,0
0,0
-0,5

0,00µs 2,50µs 5,00µs 7,50µs 10,00µs

Properties

Torque TwinCAT.Measurement.AxisNodeProperties

Common

| | |
|--------------|--------|
| Caption | Torque |
| Comment | |
| Enabled | True |
| Show Caption | True |

Grid

| | |
|-------------------|------------|
| Grid Color | 47; 79; 79 |
| Grid Line Width | 1 |
| SubGrid Divisions | 5 |
| Use Grid | True |
| Use SubGrid | False |

Scale

| | |
|-------------|--------------|
| Auto Scale | True |
| Axis Max | 0 |
| Axis Min | 0 |
| Logarithmic | False |
| Precision | 6 |
| Scale Mode | AutoGrowOnly |

Style

| | |
|------------|------------|
| Color | 47; 79; 79 |
| Line Width | 1 |
| Ticks | 10 |
| Visible | True |

Show Caption
Show Caption

Rysowanie wykresów: Scaling zmiennej Torque

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Zmienna Torque podawana jest w promilach (0,1%). Istnieje możliwość monitorowania parametru momentu w **Amperach**. W tym celu:

1. Przejdź do **Drive Manager** do zakładki: **Scaling and NC parameters**. Skopiuj wartość **I-Scale**
2. Kliknij na odpowiednią zmienną Torque w Scope: **Solution Explorer** > .. > **NC Axis 1** > **Torque**
3. W oknie: **Parametres** > **Scale Factor** wpisz skopiowaną wartość
4. Czasami istnieje konieczność zamiany kropki na przecinek (lub w drugą stronę)

Monitorowanie osi

General EtherCAT DC Process Data Startup SoE - Online Online Drive Manager NC-B: Online NC-B: Functions NC-A: Online NC-A: Functions

Linked NC/CNC axes: Channel A<=>NC: Axis 1 Channel B<=>NC: Axis 2

Tree

- Device
 - Power management
 - Safety option
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 - Scaling and NC parameters
 - Modulo value
 - Process Data/Operation mode
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 - Diagnostics
- Channel B
 - Configuration
 - Service functions
 - Diagnostics

Channel A>>Configuration>>Scaling and NC parameters

Position resolution: 1048576

Feed constant: 104.8576 mm /motor rotation Set NC Parameters

NC scaling factor: 104.8576 / 1048576 mm/Inc

NC modulo scale: 4294967295

☐ Invert NC-Encoder counting direction ☐ Invert NC-Drive motor polarity

Default parameter settings for linked NC-axis. The value can be changed later in NC-axis configuration.

| Parameter | Value | Unit |
|---|------------------|--------|
| <input checked="" type="checkbox"/> Scale factor numerator: | 104.8576 | mm/Inc |
| <input checked="" type="checkbox"/> Scale factor denominator: | 1048576 | mm/Inc |
| <input checked="" type="checkbox"/> Reference Velocity: 110% of Max motor speed | 5152.05175466667 | mm/s |
| <input checked="" type="checkbox"/> Maximum Velocity: 100% of Max motor speed | 4683.68341333333 | mm/s |
| <input checked="" type="checkbox"/> Manual Velocity (Fast): 30% of Max motor speed | 1405.105024 | mm/s |
| <input checked="" type="checkbox"/> Manual Velocity (Slow): 5% of Max motor speed | 234.184170666667 | mm/s |
| <input checked="" type="checkbox"/> Calibration Velocity (towards plc cam): 1% of Max motor speed | 46.8368341333333 | mm/s |
| <input checked="" type="checkbox"/> Calibration Velocity (off plc cam): 1% of Max motor speed | 46.8368341333333 | mm/s |
| <input checked="" type="checkbox"/> Acceleration: with an acceleration time of 1s | 7025.52512 | mm/s² |

Max motor speed = 4683.683 (mm/s)

Scale factors for scope view

I-Scale: 0.0058 A/Inc

T-Scale: 0 Nm/Inc

v-Scale rot.: 5.58793544769287e-005 rpm/Inc

v-Scale load: 9.765625e-005 mm/s

v-Scale: 0.0001 mm/Inc

Rysowanie wykresów: Scaling zmiennej Torque

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The screenshot displays the Beckhoff TwinCAT software interface, specifically the 'Scope YT NC Project' window. The interface is divided into three main sections: the Solution Explorer on the left, the Scope window in the center, and the Properties window on the right.

Solution Explorer: The tree view shows the project structure. Under 'TwinCAT Measurement Project1', 'Scope YT NC Project' is expanded, showing 'NC Axis 1' and 'NC Axis 2'. Under 'NC Axis 1', the 'Torque' variable is highlighted with a red arrow.

Scope Window: The 'NC Axis 1' tab is active. It displays five stacked plots for 'Position a', 'Velocity', 'Acceleration', 'Position L', and 'Torque'. The 'Torque' plot is at the bottom, showing a range from -0,5 to 0,5 on the y-axis and 0,00µs to 10,00µs on the x-axis.

Properties Window: The 'Torque1' properties are shown. The 'Scale Factor' is set to 0,0058, highlighted with a red arrow. The 'BitMask' is set to 0xFFFFFFFF.

| Property | Value |
|-------------------|-----------------------------|
| Target System | CX-1CAA12 (5.28.170.18.1.1) |
| Time Offset [s] | 0 |
| Use Local Server | True |
| Common | |
| Comment | |
| Visible | True |
| Line | |
| Antialias | True |
| Fill Color | 50; 30; 144; 255 |
| Fill Mode | None |
| Fill Transparency | 50 |
| Graph Type | Line |
| Line Color | 30; 144; 255 |
| Line Width | 1 |
| Marks | |
| Mark Color | 30; 144; 255 |
| Mark Size | 3 |
| Marks | Auto |
| Modify | |
| BitMask | 0xFFFFFFFF |
| Offset | 0 |
| Scale Factor | 0,0058 |
| Time Shift [µs] | 0 |